

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A network control framework apparatus for controlling resources at an intermediate network element connecting two or more communications networks comprising:

- a) a gateway module (101) providing gateway functionality,
- b) a rule engine module (102) to perform network resource control decision based on specified rules, wherein the rules are specified in a rule specification format hereafter referred to as a Rule Specification,
- c) at least one special package (103) added on to the rule engine module offering specialized functionality to the rule engine module,
- d) a rule injection module (104) to inject or remove Rule Specification to or from the rule engine module, and
- e) a means for distribution of said Rule Specification to at least one intermediate network element comprising
 - i. means for distribution of indications in the Rule Specification to indicate that part or whole of the Rule Specification is to be distributed,
 - ii. means for distribution of a signature embedded into data packets to announce the capabilities of the intermediate network elements the data packet traversed,

iii. means for parsing the Rule Specification to determine if part or whole of the specified Rule Specification is distributed,

iv. means for identifying the target network element to distribute part or whole of a Rule Specification,

v. means for distribution of a signalling embedded into data packets to inform target network element of the distribution of part or whole of Rule Specification,

vi. means for retrieval of the part or whole of Rule Specification distributed to the target network element from the intermediate network element that distributes the part or whole of Rule Specification.

2. (Original) The apparatus as recited in claim 1, wherein the format of said indications of part or whole of Rule Specification for distribution comprises

i. the specification of the direction of distribution by specifying the end-point of the specified direction,

ii. the specification of the number of intermediate network elements towards the specified endpoint,

iii. the specification of the number of intermediate network elements from the specified endpoint, and/or

iv. the specific content distributed at the intermediate network elements.

3. (Original) The apparatus as recited in claim 1, wherein the format of said signature embedded into data packets comprises

i. the identification of the intermediate network element the signature belongs to,

ii. the special packages that are installed on the intermediate network element the signature belongs to, and

iii. the capability of accepting or generating part or whole of a Rule Specifications for distribution.

4. (Currently Amended) The apparatus as recited in claim 1 ~~or 3~~ wherein the signatures of the intermediate network elements that the data packets traversed are stored with the starting and ending points between which the data packets traversed in the order of which the data packets traversed and the transmission protocol the data packets belongs to.

5. (Currently Amended) The apparatus as recited in claim 1, ~~3 or 4~~, wherein the format of said signature comprises the identification of the intermediate network element and the installed at least one special package at the intermediate network element.

6. (Currently Amended) The apparatus as recited in claim 1 ~~claims 1, 3, 4 or 5~~, wherein the format of said signatures comprises

- i. the identification of the ending point that the data packets flow to,
- ii. the identification of the starting point that the data packets flow from,
- iii. the transmission protocol the data packets belongs to,
- iv. the array of signatures of the intermediate network elements in the order of the data packets traverse from the intermediate network element where the data format is stored to the ending point, and
- v. the number of signatures of the intermediate network elements in the order of the data packets traverse from the intermediate network element where the data format is stored to the ending point.

7. (Currently Amended) The apparatus as recited in claim 1 ~~any of the preceding claims~~, further comprising means for signalling to signal the intermediate network element to express the desire to distribute collection of rules in a Rule Specification to the intermediate network element comprising

- i. the identification of the intermediate network element where the collection of rules in a Rule Specification is distributed to,
- ii. the identification of the intermediate network element where the collection of the at least one rules in a Rule Specification is distributed from, and
- iii. the identification of the collection of the at least one rule in a Rule Specification.

8. (Currently Amended) The apparatus as recited in claim 1 ~~any of the preceding claims~~, further comprising a means of retrieving the collection of rules in a Rule Specification from the intermediate network element that distributes the collection of rules by the intermediate network element where the collection of rules is distributed to, comprising

- i. means for establishing a communication channel between the intermediate network element where the collection of rules is distributed to and the intermediate network element where the collection of rules is distributed from,
- ii. means for providing the identification of the collection of rules that is distributed via the communications channel by the intermediate network element where the collection of rules is distributed to, and
- iii. means for transmitting the collection of rules that is distributed via the communications channel by the intermediate network element where the collection of rules is distributed from.

9. (Currently Amended) The apparatus as recited in claim 1 ~~any of the preceding claims~~, wherein said communications networks comprise an endpoint node, hereafter referred to as a client node, for sending a request to the other endpoint node, hereafter referred to as a server node, via at least one intermediate network element, wherein the server node is adapted for accepting the request with an appropriate response, wherein said communications networks further comprise means for setting up a communications channel between the server node and the client node through the intermediate network elements, and wherein the server node is adapted for starting transmitting data packets through the communications channel to the client node until the client node sends a request, via the intermediate network elements, to tear down the communications channel, and wherein the client node is adapted for transmitting information about the transmission statistics back to the server node.

10. (Original) The apparatus as recited in claim 9, further comprising a means of providing the author of Rule Specification to trigger a singular or plurality of rules at a intermediate network element based on the following control methods

i. the rule to be evaluated when the intermediate network element received a request packet from the client node to the server node,

ii. the rule to be evaluated when the intermediate network element received a response packet from the server node to the client node,

iii. the rule to be evaluated when the intermediate network element received a data packet containing contents sent by the server node to the client node through the communications channel established between the server node and the client node,

iv. the rule to be evaluated when the intermediate network element received a data packet containing the transmission statistics from the client node to the server node,

v. the rule to be evaluated when the intermediate network element received a specified number of data packet containing contents sent by the server node to the client node through the communications channel established between the server node and the client node, and

vi. the rule to be evaluated when the intermediate network element received a data packet containing contents sent by the server node to the client node through the communications channel established between the server node and the client node after the elapse of a recurrent timer of a specified timer value.

11. (Currently Amended) The apparatus as recited in claim 1 ~~any of the preceding claims~~ comprising a control means for using a set of parameters in the Rule Specification to control at least one content or content delivery sessions to achieve device independence in the delivery of said content, comprising

i. the set of User Preference parameters consisting of the preferences of the human user consuming the content,

ii. the set of Agent Capabilities parameters consisting of the capabilities of the software agent employed by the human user to retrieve the content,

iii. the set of Device Capabilities parameters consisting of the capabilities of the hardware employed by the human user to retrieve the content, and

iv. the set Natural Environment parameters consisting of the information about the environment in which the human user retrieves the content.

12. (Original) The apparatus as recited in claim 13, wherein the set of User Preference parameters comprises

- i. the human user's preferences on the method of retrieving the content,
- ii. the human user's preferences on the language used in the retrieved contents,
- iii. the human user's preferences on the presentation of the retrieved content,
- iv. the age group of the human user retrieving the content,
- v. the gender of the human user retrieving the content, and
- vi. the employment status of the human user retrieving the content.

13. (Original) The apparatus as recited in claim 11, wherein the set of Agent Capabilities parameters comprises

- i. the type of software agent employed by the human user to retrieve the content,
- ii. the content formats supported by the software agent employed by the human user to retrieve the content,
- iii. the content languages supported by the software agent employed by the human user to retrieve the content, and
- iv. the transmission protocols supported by the software agent employed by the human user to retrieve the content.

14. (Original) The apparatus as recited in claim 11, wherein the set of Device capabilities parameters comprises

- i. the type of hardware employed by the human user to retrieve the content,

- ii. the processor speed and processor family of the hardware employed by the human user to retrieve the content,
- iii. the memory capacity of the physical and secondary storage of the hardware employed by the human user to retrieve the content,
- iv. the display depth and resolution of the hardware employed by the human user to retrieve the content, and
- v. the operating system running on the hardware employed by the human user to retrieve the content.

15. (Original) The apparatus as recited in claim 11, wherein the set of Natural Environment parameters comprising

- i. the information of the location where the human user is retrieving the content,
- ii. the information of the mobility of the human user retrieving the content, and
- iii. the information of the illuminations conditions in which the human user is retrieving the content.

16. (Currently Amended) The apparatus as recited in claim 11 ~~any of claims 11 to 14~~, wherein the at least one special package is capable of interpreting and evaluating said Rule Specification.

17. (Original) A network control framework method for controlling resources at an intermediate network element connecting two or more communications networks comprising the steps of:

- a) providing gateway functionality by a gateway module,

b) performing network resource control decision by a rule engine module based on specified rules, wherein the rules are specified in a rule specification format hereafter referred to as a Rule Specification,

c) offering specialized functionality to the rule engine module by at least one special package added on to the rule engine module,

d) injecting or removing Rule Specification to or from the rule engine module by a rule injection module, and

e) distribution of said Rule Specification to at least one intermediate network element comprising the steps of

i. distribution of indications in the Rule Specification to indicate that part or whole of the Rule Specification is to be distributed,

ii. distribution of a signature embedded into data packets to announce the capabilities of the intermediate network elements the data packet traversed,

iii. parsing the Rule Specification to determine if part or whole of the specified Rule Specification is distributed,

iv. identifying the target network element to distribute part or whole of a Rule Specification,

v. distribution of a signalling embedded into data packets to inform target network element of the distribution of part or whole of Rule Specification,

vi. retrieval of the part or whole of Rule Specification distributed to the target network element from the intermediate network element that distributes the part or whole of Rule Specification.

18. (Original) The method as recited in claim 17, further comprising a step of extracting the signature of intermediate network elements embedded in at least one data packet, comprising the steps of

- i. checking if there are embedded signatures in the data packets,
- ii. checking if there exist a signature in a predetermined data format that is previously stored having the same starting and ending points and transmission protocol,
- iii. allocating a new data format when there is no data format that is previously stored having the same starting and ending points and transmission protocol,
- iv. purging data stored in the data format that previously existed having the same starting point, ending point and transmission protocol,
- v. preparing an empty last-in-first-out data structure,
- vi. extracting each embedded signature in the data packet and pushing it to the last-in-first-out data structure,
- vii. removing each element in the last-in-first-out data structure and recording it to the predetermined data format, and
- viii. recording the number of embedded signature extracted in the predetermined data format.

19. (Currently Amended) The method as recited in claim 17 ~~one of claims 17 or 18~~, further comprising a step of parsing a Rule Specification to determine if part or whole of the Rule Specification is to be distributed comprising the steps of

- i. checking each rule in the Rule Specification for syntactical validity,
- ii. rejecting the rule if there is syntactical errors,
- iii. checking the rule for a distribution indication,
- iv. evaluating the rule locally if there exist no distribution indication,
- v. determining the remote intermediate network element to distribute the rule to,

- vi. evaluating the rule locally if no suitable remote intermediate network element to distribute the rule to can be found,
- vii. checking if the remote intermediate network element contains the special package or special packages required in the rule,
- viii. evaluating the rule locally if the remote intermediate network element do not have the required special package or special packages, and
- ix. distributing the rule to the remote intermediate network element.

20. (Original) The method as recited in claim 17, further comprising a method of determining the remote intermediate network element that a rule is to be distributed to given a predetermined distribution indication, comprising the steps of

- i. locating a signature in a predetermined data format with the matching starting point, ending point and transmission protocol,
- ii. declaring no suitable remote intermediate network element if no predetermined data format can be located,
- iii. setting a temporary variable to the specified number of the intermediaries towards or from the specified endpoint in the given distribution indication,
- iv. setting the temporary variable to the value of the number of intermediaries as given in the located predetermined data format if the specified number of the intermediate network elements towards or from the specified endpoint in the given distribution indication is greater than the number of intermediate network elements towards or from the specified ending point in the given distribution indication,
- v. whereas the specified distribution indication consists of the specification of the ending point and the specification of the number of

intermediate network elements towards the specified ending point, set the temporary variable to a value equals the number of intermediate network elements given in the located predetermined data format minus the original value in the temporary variable,

vi. whereas the specified distribution indication consists of the specification of the ending point and the specification of the number of intermediate network elements from the specified ending point, set the temporary variable to a value equals the original value in the temporary variable minus 1,

vii. declaring the remote intermediate network element to be the network element specified in a signature stored in the located predetermined data format where the signature has an index in the array of signatures in the located predetermined data format equals to the value stored in the temporary variable should such an index exist, and

viii. declaring no suitable remote intermediate network element should the index equal to the value stored in the temporary variable does not exist in the array of signatures in the located predetermined data format.

21. (Currently Amended) A communications network comprising at network control framework apparatus as recited in claim 1 ~~any of claims 1 to 16~~ for controlling resources at an intermediate network element connecting two or more communications networks.